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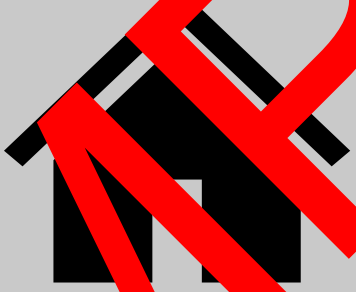
# Limited Indoor Air Quality Assessment Report
# at
# CLIENT NAME

ANY ADDRESS
ANY CITY, ST ZIP





**Report Prepared for:**

CLIENT INFO

**Dated:**

## Contents

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AHU | Air-Handling Unit |
| AIHA | American Industrial Hygiene Association |
| ASHRAE | American Society of Heating, Refrigerating and Air-Conditioning Engineers |
| ASTM | American Society for Testing and Materials |
| CO | Carbon Monoxide |
| CO2 | Carbon Dioxide |
| EMLAP | Environmental Microbiology Laboratory Accreditation P[illegible]am |
| HVAC | Heating, Ventilating, And Air-Conditioni[illegible] |
| IAQ | Indoor Air Quality |
| IAQI | Indoor Air Quality Inspectors Inc |
| NIST | National Institute for Standards an[illegible]chnology |
| NVLAP | National Voluntary Labora[illegible] Accredi[illegible]gram |
| RH | Relative Humidity |
| RM | Risk Manager |
| HCHO | Formaldehyde |
| TVOC | Total Volatile[illegible]rganic Compou[illegible]s |
| O3 | Ozone |
| OSHA | Occupational[illegible]alth A[illegible]inistration |
| EPA | Environmental P[illegible]ction Ag[illegible] |
| NAAQS | National Ambient A[illegible]uality Stan[illegible]s |
| PACM | [illegible]med Asbestos-Co[illegible]ining Material |
| S- ELEVATED | [illegible]ted |
| PELS | [illegible]missible E[illegible]Limits |
| WDB | W[illegible]r Dam[illegible]d Build[illegible] |
| µm | Mic[illegible] |

Abbr[illegible]ions inv[illegible]ing s[illegible]entific volume and measurements involving media or air sampling

| | |
|---|---|
| Spores/m3 | [illegible]gal spores per cubic meter of air |
| LPM | [illegible]iters Per Minute |
| NTE | Not to exceed |
| °F degree | Fahrenheit |
| PPM | Parts Per Million |
| MG/M3 | Milligram Per Cubic Meter |

DATE

CLIENT NAME
ANY ADDRESS
ANY CITY, ST ZIP

Attention: CLIENT NAME

Subject: Limited Indoor Air Quality Assessment Report

Indoor Air Quality Inspectors Inc. has completed this fi[illegible]ndoor [illegible]Quality [illegible]ssment [illegible]ort for the above referenced location.

This Report has been prepared based on observati[illegible]made and [illegible]mple data collected during DATE building investigation.

Opinions made or formed, other than thos[illegible]sed here[illegible]e those of the reader and in no way shall obligate Indoor Air Quality Inspectors I[illegible] Th[illegible]dings pr[illegible]ted in this Report are representative of the date and times that the readings were c[illegible]ecte[illegible]e findings presented herein should not be used or relied upon to eval[illegible]air quality m[illegible]surem[illegible] obtained at significantly later dates.

If you have any questions, plea[illegible]el fre[illegible]onta[illegible]our office at (901) 221-2987.

INDOOR AIR QUALITY INSPECTORS I[illegible]

Sincerely,

[illegible] INSPECTO[illegible]

## DISCLAIMER

This is Indoor Air Quality Inspectors Inc's (IAQI) report of a walk-through, visual survey and an on-site m rement of the parameters described in this report. The test results only apply to those rooms or spaces that were t d and that are specifically described during the course of this survey. This document may not be copied or distribut ithout writ permission from Indoor Air Quality Inspectors Inc. Information provided in this document is provided 'a witho rranty of any kind, either expressed or implied, including but not limited to the implied warranties of merchantabili ess for a particular purpose. Government and industry guidelines, vendor product specifications and other informatio ered from other sources are always evolving. The included information has been provided for informational purposes, at t t effort Indoor Air Quality Inspectors Inc to be up-to-date. However, Indoor Air Quality In ctors Inc. takes no responsibi e or omissions in the text provided on the subject of government and Industry guide vendor product specifications er information gathered from other sources and included in this document.

## SCOPE OF WORK

The purpose of the survey was to locate, identify, sa , and assess t condition th ing's indoor air quality.

The indoor air quality inspection was perfor in confor ith modified protocols set forth by the Environmental Protection Agency (EPA), Nat mbient A lity Standards (NAAQS) and Occupational Safety and Health Administration (OSHA).

## METHODOLOGY

Our inspection included a visu se t, indoo ir quality laser particulate sampling, photo Ionization Detector (PID) sensors for gases a VOC, fo leh detection, digital moisture analyzing and Zefon bio air sampling. We utilized an air blo to agitat site pre-inspection.

**These method lied to every sit zone tested in this facility. The report will be sort into floors and zones for co aris sis and clari**

### Methodology De tion

**pection:** A through of the facility was performed to document the status of general conditions and issues that could a t healthy indoor air quality. Doing this time each floor area was divided into zones for clarity and simplicity eporting inspection findings.

**Real Measu ment f IAQ Parameters:** Real-time measurements of comfort parameters (i.e., perature, relat humidity and respirable particulate matter) in the air with sizes at (PM0.3µm (micrometer), PM µm, PM1.0µm, PM2.5µm and PM10µm size classes) were obtained using calibrated port le digit truments for 1 (one) minute per sample. Afterwards the measurements were compared with re t industry standards and guidelines.

**PID (Photo Ionization Detector):** A photoionization detector (PID) is a non-specific tool for measuring levels of VOCs in air gas detector that can be used to monitor indoor air quality. PIDs measure volatile organic compounds (VOCs) and other gases in concentrations from sub parts per billion to 10,000 parts per million

(ppm). We allowed the PID to operate continually as we evaluated the conditions of the buildi[illegible]napshot readings were recorded within each zone.

**Air sampling for MICROBIAL GROWTH spores:** Air samples for non-viable fungal sp[illegible] were collect[illegible]n representative locations where IAQ screening was performed with 2 and 5 minutes per s[illegible]les. Th[illegible]ning of the samples was based on factors such as background debris, weather conditions, and peopl[illegible]se proximity). With these factors in mind helps ensure a more successful sampling process.

**Additionally, two ambient (outdoors) set of IAQ measurements on w[illegible]ward and leeward sides** we[illegible] collected for comparison to indoor measurements. Non-viable fungal spo[illegible]mples were collected on A[illegible]-O-Cell cassettes using a Zefon calibrated pump.

**Microbial Particulates sample analysis:** Microbial sample[illegible]cluding a[illegible]d blank [illegible]uality [illegible]rance) reshipped under strict chain-of-custody procedures to [illegible]L Analytical, [illegible]., an AIHA-[illegible]ed Laboratory for testing and reporting.

## SITE SPECIFIC SURVEY LIMITATIONS

The data presented and the opinions express[illegible]in [illegible]report a[illegible]alified as follows:

1. This environmental report has been prepared[illegible]r the[illegible]usive use[illegible] the CLIENT NAME (the "Client"), and is subject to, and is issued in c[illegible]nction with our [illegible]reeme[illegible]nd understanding. Any use or reliance upon information provided in this [illegible]t, [illegible]out the sp[illegible]fic writt[illegible]uthorization of the Client and Indoor Air Quality Inspectors, Inc, (IAQI) si[illegible]e at [illegible]ser's i[illegible]vidual risk.

2. IAQI has obtained and relied upon i[illegible]mation from[illegible]ultiple sources to form certain conclusions regarding the Site when c[illegible]g this assessmen[illegible]cept as otherwise noted, no attempt has been made to verify the accuracy or c[illegible]mplet[illegible]f such inform[illegible]n or verify compliance by any party with federal, state or local laws or regu[illegible]ons.

3. IAQI has obtained [illegible]d [illegible]ed upon laboratory analytical results in conducting the sampling. This [illegible]n was used[illegible]rm conclusions regarding the types and quantities of bio-aerosols and Fungal at the Site. IAQI has not p[illegible]rmed an independent review of the reliability of this laboratory data.

4. The f[illegible]gs, c[illegible]rvatio[illegible]and conclusions presented in this report are limited by the scope of services c[illegible]d in our Agr[illegible]ment, which reflects schedule and budgetary constraints imposed by Client. Furthermore, the [illegible]essment has been conducted in accordance with generally accepted environmental practices. No oth[illegible]warranty, expressed or implied, is made.

5. The [illegible]usions presented in this report are based solely upon information gathered by IAQI to date. Should further environmental or other relevant information be discovered at a later date, the Client should immediately bring the information to IAQI's attention. Based upon an evaluation and assessment of relevant information, IAQI may modify this report and its conclusions.

## EXECUTIVE SUMMARY

Indoor Air Quality Inspectors, Inc. (IAQI) was contracted by CLIENT NAME to conduct an I[illegible]or Air Quality Assessment of the building located at ANY ADDRESS, Memphis, Shelby County, Tenne[illegible].

The IAQ assessment was conducted at CLIENT NAME on April 4th and April 6th 2024 by Tra[illegible]ples [illegible]ouncil-certified Indoor Environmental Consultant by Council for Engineering and Scientific Specialty [illegible]s (CESB). (Certification #2204022, Expiration 04/30/2024. The RM required that the testing be based on [illegible] American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Environmental Protec[illegible] Age (EPA), National Ambient Air Quality Standards (NAAQS) and Occupati[illegible] Safety and Health Admini[illegible] (OSHA) guidelines.

The IAQI test consist of the following major indoor air pollu[illegible]:

- Fungal
- Non-Fungal Particles
- Inhalable Particle (Dust)
- V[illegible]
- Form[illegible]de (HCHO)

In accordance with ASHRAE, IAQI also took measurem[illegible] of the f[illegible]wing at different levels in the building:

- Carbon Dioxide
- Carbon Monoxide
- Relative Humidity
- Ozone
- Temperature

## SUMMARY OF FINDINGS AND PLAN OF A[illegible]TIO[illegible]OR ANY [illegible]DRESS.

- **FUNGAL** – IAQI conducte[illegible] specific Funga[illegible]ampli[illegible]tside the building to obtain a baseline of the number and types of fun[illegible]po[illegible]d non-fu[illegible]l particl[illegible]n the air. This baseline was compared to the spores and particles collecte[illegible] the sa[illegible]g loc[illegible]ions since inside spores and particles counts above baseline could indicate internal [illegible]ces of Fu[illegible]l particles.
  - **Findin[illegible]**

**IAQ RAT[illegible]G COM[illegible]ION BY FL[illegible]R (FUNGAL AND NON-FUNGAL) per EMSL LABS**

**TABLE-[illegible] AC[illegible]ABLE SE – SLIGHTLY ELEVATED EL - ELEVATED**

**INTERPATATION OF [illegible]BL[illegible]**

1. ASEMENT L[illegible]L –
   a. 27% o[illegible]e sampled Air Quality contains Acceptable levels of Fungal matter.
   b. 73% of [illegible] sampled Air Quality contains Slightly Elevated levels of Fungal matter.
   c. [illegible]% of t[illegible] sampled Air Quality contains Acceptable levels of non-Fungal particles.
   d. 6[illegible] of the sampled Air Quality contains Slightly Elevated levels of non-Fungal particles.
2. 1ST FLOO[illegible]
   a. [illegible]% of the sampled Air Quality contains Acceptable levels of Fungal matter.
   b. [illegible]4% of the sampled Air Quality contains Elevated levels of Fungal matter.
   c. 41% of the sampled Air Quality contains Slightly Elevated levels of Fungal matter.
   d. 85% of the sampled Air Quality contains Acceptable levels of non-Fungal particles.
   e. 15% of the sampled Air Quality contains Slightly Elevated levels of non-Fungal particles.
3. 2nd FLOOR-
   a. 25% of the sampled Air Quality contains Acceptable levels of Fungal matter.

b. 31% of the sampled Air Quality contains Elevated levels of Fungal matter.
c. 44% of the sampled Air Quality contains Slightly Elevated levels of Fungal matter.
d. 66% of the sampled Air Quality contains Acceptable levels of non-Fungal particles.
e. 34% of the sampled Air Quality contains Slightly Elevated levels of non-Fungal particles.

4. **3rd FLOOR-**
   a. 19% of the sampled Air Quality contains Acceptable levels of Fungal matter.
   b. 51% of the sampled Air Quality contains Elevated levels of Fungal matter.
   c. 30% of the sampled Air Quality contains Slightly Elevated levels of Fungal matter.
   d. 19% of the sampled Air Quality contains Acceptable levels of non-Fungal particles.
   e. 51% of the sampled Air Quality contains Slightly Elevated levels of non-Fungal particles.
   f. 30% of the sampled Air Quality contains Slightly Elevated levels of non-Fungal particles.

5. **Penthouse FLOOR-**
   a. 100% of the sampled Air Quality contains Elevated levels of Fungal matter.
   b. 50% of the sampled Air Quality contains Acceptable levels of non-Fungal particles.
   c. 50% of the sampled Air Quality contains Slightly Elevated levels of non-Fungal particles.

6. **ANY ADDRESS Total Building Indoor Air Composition**
   a. 8% of the sampled Air Quality contains Acceptable National Levels.
   b. 64% of the sampled Air Quality contains of Fungal matter.
   c. 28% of the sampled Air Quality contains non-Fungal matter.

7. Bacteria- Bacteria was found in every sample taken (Bacillus megaterium, Bacillus cereus Bacillus plakortidis)- **See attached report for more information,**

8. **VOCs** – levels of volatile organic compounds (VOCs) recorded at each location were within acceptable range compared to OSHA PELS.

9. **Formaldehyde** – the levels of formaldehyde recorded at each location were within an acceptable range, compared to OSHA PELS.

10. **Carbon monoxide** – concentrations in all areas were less than the EPA, and ASHRAE recommended a limit of 9 ppm.

**Carbon dioxide** – concentrations in all tested spaces were less than the ASHRAE limit of 1,092 ppm.

12. **Temperature** – none of the tested spaces had temperatures greater than the ASHRAE recommended levels.

13. **RH** – the relative humidity in all tested spaces was within the ASHRAE guidelines of ≤67% and for this investigation, ≤ 65%. None of the tested locations had a relative humidity greater than 65%.

14. **Dew Point-** The levels of Dew Point recorded at each location were within acceptable ranges compared to EPA PELS.

15. **Pressure (PA)-** The levels of air pressure recorded at each location were within ac[illegible]able ranges compared to ASHRAE PELS, but some areas experience unusual zero or negati[illegible]essure.

## PROPOSED ACTION PLAN

To address these findings, IAQI makes the following **ACTION PLAN**:

## POLLUTANTS PATHWAY AND DRIVING FORCES

Based on the summary of information gathered, the pos[illegible]ays to p[illegible]tants are [illegible]llows:

- Air pressure differences created by posi[illegible] and negativ[illegible]orces move[illegible]he pollutants from areas of higher pressure to area[illegible]ower pressu[illegible]hrough any av[illegible]able openings in building walls, ceilings, floors, doors, wi[illegible]s, and [illegible]AC systems.
- Ongoing building moisture inti[illegible]problem.
- Inability to encapsulate source o[illegible]llu[illegible]s from t[illegible]per and lower levels of the building allowing fewer pollutants to expos[illegible]he b[illegible]g's inha[illegible]tants and indoor air quality.
- Lack of performa[illegible]in[illegible] Exhaust [illegible]stems t[illegible]emove excessive particles and fungal.
- Substandard ventilatio[illegible]tem that [illegible]tes poor thermal control, airflow, fresh air intak[illegible]nd pollutants filte[illegible]

**The Overall B[illegible]ding I[illegible]ting is– [illegible]VATED RISK FACTORS= UNHEALTHY BUILDING**

| | | |
|---|---|---|
| U[illegible]thy | Wh[illegible]ir quali[illegible]s in this [illegible]e, everyone who is a[illegible]el[illegible]oors may experience effects. Mem[illegible] of sensitive groups are likely to e[illegible]rience more serious effects. | Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged indoor exertion; everyone else, especially children, should limit prolonged indoor exertion |

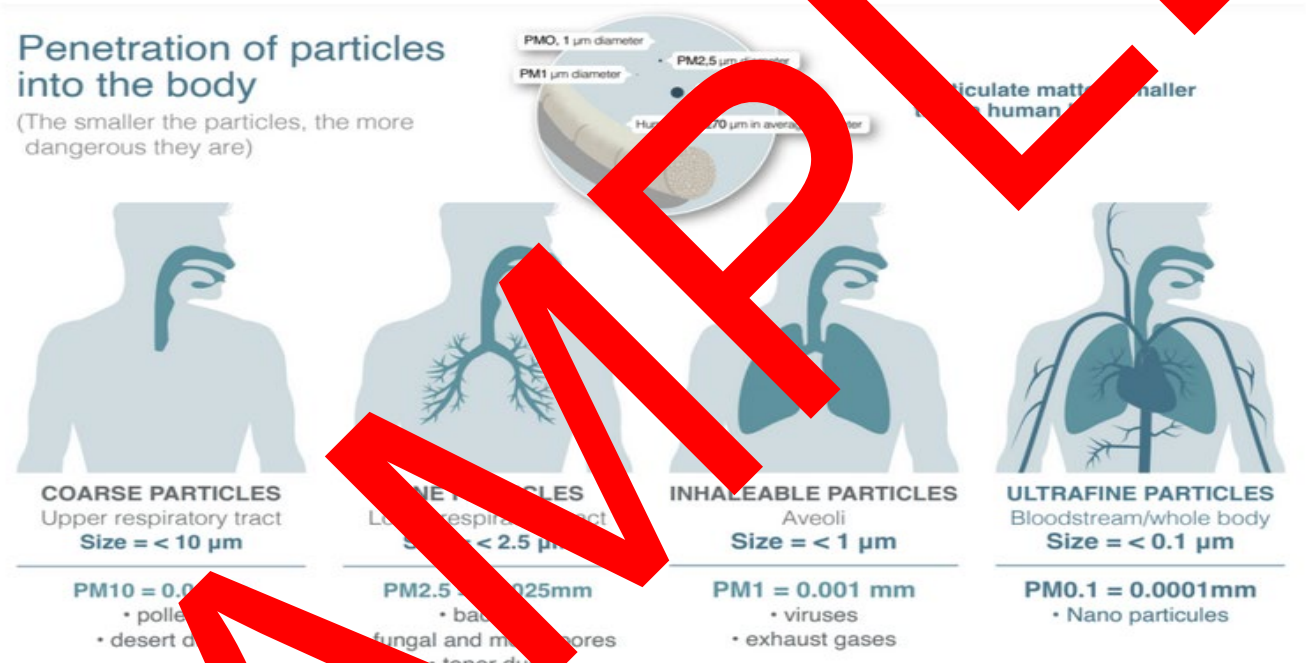
## CONDITIONS FOR HUMAN OCCUPANCY

### HEALTH EFFECTS O[illegible]PARTICULATE MATTER

The effects of PM[illegible]health occur at levels of exposure currently being experienced by most urban and rural popu[illegible]tions i[illegible]n developed and developing countries. Chronic exposure to particles contributes to the risk of develo[illegible]diovascular and respiratory diseases, as well as of lung cancer. In developing countries, exposure to pollutants from indoor combustion of solid fuels on open fires or traditional stoves increases the risk of acute lower respiratory infections and associated mortality among young children; indoor air pollution from solid fuel use is also a major risk factor for chronic obstructive pulmonary disease and lung cancer among adults. The mortality in cities with high levels of pollution exceeds that observed in relatively cleaner cities by 15–20%. Even in the EU, average life expectancy is 8.6 months lower due to exposure to PM2.5 produced by human activities1. It is

unlikely that one standard or guideline will lead to complete protection to the health effects of par[illegible]ate matter. Particulates less than 10 µm diameter are the most dangerous because are inhalable and can ge[illegible]ep in to your lungs and even your bloodstream. Due to this, some of the health effects are increased respi[illegible]y symptoms such as irritation of the airways, coughing, or difficulty breathing; i.e., -decreased lung ca[illegible]y -aggravated [illegible]ma -development of chronic bronchitis -irregular heart beat -non-fatal heart attacks -prematu[illegible]th of pe[illegible] with heart or lung diseases. People that already have heart or lung diseases, children and older peo[illegible]re[illegible]ones affected the most.

*Sources:1 World Health Organization Guideline, indoor & outdoor, updated Sept. 2011 http://www.who.int/mediacentre/factsh[illegible]=313*






**WHY MEASURE [illegible]RTICL[illegible]TES?**

PM [illegible]ffects more pe[illegible]t[illegible]n any other pollutant. It consists of a complex mixture of solid and liquid particles [illegible]orga[illegible]c and inorgan[illegible]ubstances suspended in the air. The particles are often identified according to their aerodynamic diameter, [illegible]either PM10 (particles with an aerodynamic diameter smaller than 10 µm) or PM2.5 (a[illegible]ic dia[illegible]er smaller than 2.5 µm). The latter are more dangerous since, when inhaled, they ma[illegible]h the per[illegible]eral regions of the bronchioles, and interfere with gas exchange inside the lungs1.

Comparing indoo[illegible]rticle counts or particle mass concentration to outdoor counts/concentration provides information re[illegible]ing the effectiveness of filtration, as well as for the potential that there are indoor sources conti[illegible]o airborne particulate matter. Many investigators have developed experience with elevated particle counts in specific particle size ranges to provide additional clues towards determining the potential sources of these particles. For example, tobacco smoke is known to be in the .01 to 1.0-micron size range, and pollens are typically >10 microns.

Establishing a baseline of particulate data to compare to when complaints arise, or when construction is in progress or after changes have been made to an occupied space can provide valuable information to a Facility Manager, Building Owner or IAQ investigator.

In some cases, tracking increasing particulate levels may be used to "bloodhound" a source of airborne particulate. Elevated particulate, in the absence of a known source, may also indicate justification for air sampling, to be sent out for detailed laboratory analysis of the chemical composition of the particles.

*Sources: 1 World Health Organization Guideline, indoor & outdoor, updated Sept. 2011 http://www.who.int/mediacentre/factsheets/*

## TEMPERATURE

Conditions for Human Occupancy are addressed in ASHRAE Standard 55-2017. The standard is designed to provide comfort for an estimated 80% of occupants. The standard provides for a temperature range between approximately 67 and 82 °F. A more specific range based on relative humidity, season, clothing worn, activity levels, and other factors can be determined. For example, the standard does not specify a lower humidity range but notes that issues of comfort, skin irritation, dry mucous membranes, and static electricity may arise when the relative humidity is less than 30%. ASHRAE Standard 62.1-2016 does recommend an upper limit of 67% humidity to avoid conditions conducive to microbial growth. For this investigation, IAQI used a conservative upper limit of 65%. The recommended ASHRAE temperature range for schools and office spaces in summer is 75°F-80.5°F.

## HEALTH EFFECTS OF WDB

The health of those who live, attend school, or work in damp buildings has been a growing concern for years. This is due to a wide range of reported building-related symptoms and illnesses. Research has found that people who spend time in damp buildings report health problems including the following:

- Respiratory symptoms: nose, throat, lungs
- Asthma development: getting worse
- Development: worsening of asthma
- Hypersensitivity pneumonitis (a rare lung disease caused by an immune system response to breathing bacteria, fungi, organic dusts, and chemicals)
- Respiratory infections
- Allergic rhinitis (often called “hay fever”)
- Bronchitis
- Eczema

Exposure in damp buildings are complex. They vary from building to building and in different places within a building. Moisture allows indoor mold to multiply on building materials and surfaces. People inside buildings may be exposed to microbes and their structural components, such as spores and fungal fragments. Mold may produce substances that can cause or worsen health problems. These substances vary depending on the mold species and on conditions related to the indoor environment. Moisture can also attract cockroaches,

rodents, and dust mites. Moisture-damaged building materials can release volatile organic compounds that can also cause health problems.

Researchers have not found exactly how much exposure to dampness-related substances it takes to cause health problems. Studies report that finding and correcting sources of dampness is more effective in preventing health problems than counting indoor microbes.

## HEALTH EFFECTS OF HCHO

Formaldehyde (HCHO), a colorless, pungent-smelling gas, can cause watery eyes, burning sensations in the eyes and throat, nausea, and difficulty in breathing in some humans exposed at elevated levels (above 0.1 parts per million). High concentrations may trigger attacks in people with asthma. There is evidence that some people can develop sensitivity to formaldehyde. It has also been shown to increase cancer in animals and may cause cancer in humans. Health effects include eye irritation, wheezing and coughing; fatigue; skin rash; severe allergic reactions. The US National Institute of Health's National Toxicology Program[1], as of June 2011, now considers HCHO a known human carcinogen, while the USEPA describes it as a probable human carcinogen[2]. The World Health Organization's International Agency on Cancer (IRAC)[3] has designated HCHO as the cause of several types of nose and throat cancer.

Sources:

[1] NIEHS (NIH) http://www.niehs.nih.gov/health/materials/formaldehyde.pdf
[2] USEPA http://www.epa.gov/iaq/formaldehyde.html
[3] IRAC (WHO) http://monographs.iarc.fr/ENG/Monographs/vol88/mono88.pdf

## HEALTH EFFECTS OF TVOC

In sufficient quantities, some VOCs can cause eye, nose and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system. Some organics can cause cancer in animals; some (such as benzene) are suspected or known to cause cancer in humans. Key signs or symptoms associated with exposure to VOCs include conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, emesis, epistaxis, fatigue, dizziness.

The ability of organic chemicals to cause health effects varies greatly from those that are highly toxic, to those (such as Acetic Acid in approximately 5% component of vinegar) with no known health effect. As with other pollutants, the extent and nature of the health effect will depend on many factors including level of exposure and length of time exposed. Eye and respiratory tract irritation, headaches, dizziness, visual disorders, and memory impairment are among the immediate symptoms that some people have experienced soon after exposure to some organics. At present, not much is known about what health effects occur from the vast majority of organics usually found in buildings or homes.

## HEALTH EFFECTS OF CO2

Carbon Dioxide is very rarely a pollutant of direct health concern itself. Rather, because building occupants exhale CO2 (at close to 40,000 ppm) the CO2 that they breathe out is used as a tracer gas that is an excellent indicator of adequate (or inadequate) ventilation. Insufficient ventilation can lead to occupant complaints of

discomfort and reduced productivity as human and building generated pollutants build up. So combinations of these elevated pollutants may have short or long-term detrimental health effects.

CO2 will generally only be of concern as a toxic gas itself in industrial processes where bottled CO2 gas is utilized, such as breweries, or when there is an inadequately ventilated combustion process where the other combustion gases (e.g. CO, NO, NO2) will usually be of much greater concern. Typical worker exposure limits, for average 8-hour exposures, are 5000ppm CO2 or higher, and short-term worker exposure limits are typically 30,000ppm or higher.

However, recent research conducted by the Lawrence Berkeley National Laboratory (LBNL)[1] in California indicates that the CO2 itself may contribute to a reduction in creative, memory and typing skills even at low levels <2000ppm.

Sources: [1]LBNL, Elevated Indoor Carbon Dioxide Impairs Decision Making Performance 2012

## HEALTH EFFECTS OF CO

The target organs that Carbon Monoxide effects are the cardiovascular system, lungs, blood, and the central nervous system. Carbon Monoxide in low concentrations cause fatigue in healthy people and chest pain in people with heart disease. At moderate concentrations, impaired vision and coordination; headaches; dizziness; confusion; nausea; hallucinations; cyanosis (appearance of blue or purple coloration in skin). Can cause flu-like symptoms that clear up after leaving the space that contains the elevated concentrations. May be fatal at very high concentrations.

Acute effects are due to the formation of carboxyhemoglobin in the blood, which inhibits oxygen intake leading to reduced brain function.

## HEALTH EFFECTS OF OZONE

Ozone is a molecule comprised of three atoms of oxygen. Two atoms of oxygen form the basic oxygen molecule--the oxygen we breathe that is essential to life. The third oxygen atom can detach from the ozone molecule, and re-attach to molecules of other substances, thereby altering their chemical composition[1].

Exposure to ozone in the air can have a marked effect on human health. It can cause breathing problems, trigger asthma, reduce lung function and cause lung diseases. In Europe it is currently one of the air pollutants of concern. Several European studies have reported that the daily mortality rises by 0.3% and that heart disease rises by 0.4%, per 10 µg/m$^3$ increase in ozone exposure[2].

Ozone can:

- cause acute respiratory problems;
- aggravate asthma;
- cause significant temporary decreases in lung capacity of 15 to over 20 percent in some healthy adults;
- cause inflammation of lung tissue;
- lead to hospital admissions and emergency room visits;

- impair the body's immune system defenses, making people more susceptible to respi[illegible]ry illnesses, including bronchitis and pneumonia.

Who is Most at Risk from Exposure to Ozone?

- Children, older adults, and active people are most at risk from exposure to ozo[illegible]
- Asthmatics: Asthma is a growing threat to children and adults.
- Ozone can aggravate asthma, causing more asthma attacks, increased use of medica[illegible] more medical treatment and more visits to hospital emergency clinics.
- Healthy Adults: Even moderately exercising healthy adults ca[illegible]xperience 15 to over 20 pe[illegible]t reductions in lung function from exposure to low levels of ozo[illegible]er several hours.
- Damage to lung tissue may be caused by repeated exposures to o[illegible] -- something like repeated sunburns of the lungs -- and this could result in a red[illegible]lity of l[illegible]s people age. R[illegible]lts of animal studies indicate that repeated exposure to[illegible]h level[illegible]ozone f[illegible]veral m[illegible]s or more can produce permanent structural damage in t[illegible]ungs.

Sources:

[1]USEPA Ozone Generators that are Sold as Air Cleane[illegible] http://www.[illegible]gov/[illegible]ubs/ozonegen.html#what_is_ozone

[2]World Health Organization Guideline, indoor & outd[illegible]dated Sept[illegible]p://www.who.int/mediacentre/factsheets/fs313/en/

## WHY MEASURE RH?

Relative humidity indicates how moist the air is[illegible]Rela[illegible]humidity [illegible]be defined as the ratio of the water vapor density (mass per unit volume) to the satu[illegible]ion w[illegible]vapor d[illegible]nsity, usually expressed in percent. Relative humidity is also app[illegible]ly the ratio o[illegible]he actu[illegible]the saturation vapor pressure.

Actual vapor pressure is a measu[illegible]ent o[illegible]amou[illegible]of water vapor in a volume of air and increases as the amount of water vapor increases. A[illegible]t attains[illegible]ration vapor pressure has established equilibrium with a flat surfa[illegible]f water. That means[illegible]equal number of water molecules are evaporating from the surface of the w[illegible]r i[illegible]air as are con[illegible]ing from the air back into the water.

Relative Humidity[illegible]mong th[illegible]mon of indoor air environmental factors implicated in occupant discomfort. Elevate[illegible]umidi[illegible]has been s[illegible]own to be associated with a worsened perception of IAQ. High [illegible]lso an indica[illegible]conditions favorable to mold and microbial growth.

## HEALTH EFFECTS OF[illegible]R PRESSURE

Keeping[illegible]air pr[illegible]ure inside the house is crucial as too much positive or negative pressure can adv[illegible]y affect in[illegible]or air quality. An excessive amount of positive air pressure can cause the air inside the [illegible]m to be pushed[illegible]utside, eliminating all the benefits associated with using air conditioning. A high level of negative air pres[illegible]e, on the other hand, can draw unfiltered air inside the house, leading to the buildup of harm[illegible]l poll[illegible]s. Unbalanced air pressure could have varying impacts depending on the season, temperature, and humidity levels.

Unbalance Air Pressure can cause:

- respiratory illnesses
- Carbon Monoxide Poisoning

- Mold Growth
- Moisture Problems

There are two major types of air pressure

- Positive air pressure indicates a higher pressure inside than outside, which forces [illegible] escape. As a result, some of the hot or cold air your system produces is lost.
- Negative air pressure occurs when the pressure inside the house is lower than the outsi[illegible]essur[illegible] When this happens, you're heating or cooling devices will ha[illegible] work harder and consume[illegible] energy to move the air through your space.

## WHY MEASURE WET BULB?

Wet bulb temperature is the temperature of the air rea[illegible] a thermo[illegible]er cover[illegible] a w[illegible]-soaked cloth or by a digital hygrometer. If wet bulb temperature [illegible]ead at 100% [illegible]tive humidit[illegible] wet bulb temperature would be the exact same as the dry bu[illegible]mperature [illegible]he humidity drops, the wet bulb temperature drops as well because of evapor[illegible]tive cooli[illegible]this [illegible]ns the humidity and wet bulb temperature are directly proportional. Wet [illegible] also use[illegible]etermining the required superheat for an air conditioner as this reading takes into conside[illegible]ic[illegible]e amoun[illegible]umidity in the air going across the evaporator coil.

## WHY SAMPLE FOR BACTE[illegible]?

Fungi and bacteria reproduce [illegible]ly in place[illegible]at aren[illegible]egularly disinfected and cleaned. Lower-level areas and basements are two pla[illegible]you s[illegible]worr[illegible]bout. Spores and bacteria multiply in either dark abandoned areas or well-populated [illegible]s. Pipes, [illegible]nd other enclosed areas are also a breeding ground. These airborne [illegible]ogens can cause lo[illegible]rm respiratory illness if the problem isn't solved. They can also cause allergies, [illegible]an[illegible]like illnesses, a[illegible]even digestive problems.

## SITE INFORMATI[illegible]

*[illegible]TE -No accepte[illegible]itative regulatory standards currently exist by which to assess the health risks related to MICROBIAL GROWTH and bacterial expos[illegible] Fungal and bacteria have been associated with a variety of health effects and sensitivity varies from person to person. Several organizations, i[illegible]ding: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AI[illegible]ndoor A[illegible]ality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease C[illegible]DC), [illegible]ell as t[illegible]alifornia Department of Health Services (CADHS), have all published guidelines for assessment and int[illegible]on of MICRO[illegible] GROWTH resulting from water intrusion in buildings.*

## OUTDOOR AM[illegible]NT READINGS

Mos[illegible]bring in outdoor air to help dilute the occupant generated pollutants and the building generated pollutants that may otherwise increase over the course of the day. Such outdoor "dilution" air is often expensive to heat or to cool before distributing within the building, so the introduction of dilution air should be optimized. There is an important balance between the comfort, productivity and health implications of distributing dilution air vs. the energy costs and related environmental impact of expending this energy related to outdoor air ventilation. While indoor air is typically more polluted than outdoor air,

under certain conditions there may be elevated pollutants in the outdoor air. Elevated outdoor pollutants may include combustion gases from nearby highways (dependent on the direction the wind is blowing), naturally occurring particulates (pollen, etc.), elevated Carbon Dioxide, Ozone or other gases during an inversion layer in cities, and so on. **Therefore, it is of practical interest to compare the outdoor air measured values, to those measured indoors on the same date.**

*The figures below are utilized as the BASELINE for comparison of INDOOR readings.*

| OUTDOOR AMBIENT GAS READINGS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Location | HCHO | TVOC | CO2 | O3 | CO | TEMP | RH | DEW | PRESSURE |
| | mg/m³ | mg/m³ | ppm | ppm | ppm | | % | °F | pa |
| Location | 0.02 | 0.40 | 214 | 0.9 | 0.8 | 46 | 52.6 | 41.4 | 0.7 |
| Location | 0.00 | 0.14 | 248 | 0.0 | | 48.3 | 52.6 | 30.8 | 0.5 |

| OUTDOOR AMBIENT PARTICULATES / DUST READINGS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0.3um ug/m³ | 0.5um ug/m³ | 1.0um ug/m³ | um ug/m³ | 5.0um ug/m³ | 0um ug/m³ | TEMP | RH | |
| Location | 2.55 | 1.11 | | 7.94 | 2 | 15.71 | 54 | 29 | BASELINE |
| Location | 2.40 | 1.00 | | 6.21 | 57 | 8.78 | 57 | 26 | BASELINE |

INDOOR AIR QUALITY INTAKE GAS & DATA READINGS

| INDUSTRY STANDARDS | OSHA | OSHA | NAAQS | OSHA | ASHRAE | EPA | OSHA | EPA | ASHRAE | HAZARD |
|---|---|---|---|---|---|---|---|---|---|---|
| | <0.9 | | < 1000 | | < 50.0 | 68-79ºF | < 65% | <60 ºF | <88 ºF | +5 pa | LEVEL |
| | HCHO | VOC | CO2 | O3 | CO | TEMP | RH | DEW | TEMP | PRESSURE | |
| | mg/m³ | m³ | ppm | ppm | ppm | °F | % | °F | °F | pa | |
| Location Basement | | | | | | | | | | | |
| Location | 0.03 | 0.2 | 303 | 0.0 | 0.4 | 64.4 | 57.9 | 46.6 | 52.6 | 0.4 | ACCEPTABLE |

OFFICIAL BREATHABLE PARTICULATES READINGS

| PARTICULATES SIZES | | | | | | | | Relative Humidity %RH | Date / Time | Hazard Level |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Location | BREATHABLE | | | FINE | COARSE | | | | | |
| | um | 0.5µm cum | 1.0µm cum | 2.5µm cum | 5.0µm cum | 10.0µm cum | Temp °F | | | |
| OUTSIDE READINGS | | | | | | | | | | |
| Location | 0.78 | 0.41 | 1.67 | 8.24 | 22.03 | 11.09 | 63 | 44 | 04-Apr-24 07:59:46 AM | BASELINE |
| Location | 0.24 | 0.12 | 0.66 | 3.80 | 16.96 | 10.63 | 64 | 37 | 04-Apr-24 08:09:42 AM | BASELINE |

**Red indicates the indoor values are greater than outside values = (Indoor air WORST THAN OUTDOOR AIR)**

Conclusion: The types and concentrations of particulates found in these areas are **GREATER** compared to the levels found in the outdoor control sample. The result indicates that there is a **HIGH** possibility of IAQ problems.

## EQUIPMENT USED

| | |
|---|---|
|  | **Handheld 3016 IAQ Particle Counter**<br>UNTL/046-23-Calibration Exp 8/28/2024 |
|   | **AdvancedSense Pro with IQ-610 Probe**<br>UNTL/046-23-Calibration Exp 8/28/2024 |
|  | **FORMALDEHYDE / VOC DETECTOR**<br>Calibration- Before Use |
|  | **ZEFON BIO-PUMP PLUS**<br>Calibration- Before Use |
|  | **RYOBI BLOWER** |

## APPENDIX – SAMPLES LOCATION DRAWINGS

# APPENDIX A – OFFICIAL LAB TESTING REPORTS

## [illegible]TERIA SA[illegible]MPL[illegible]G REPORT




## FUNGALS S[illegible]PLING R[illegible]POR[illegible] (Air-o-cell and Swab)

# APPENDIX III – INSPECTION PICTURES

## END OF REPORT